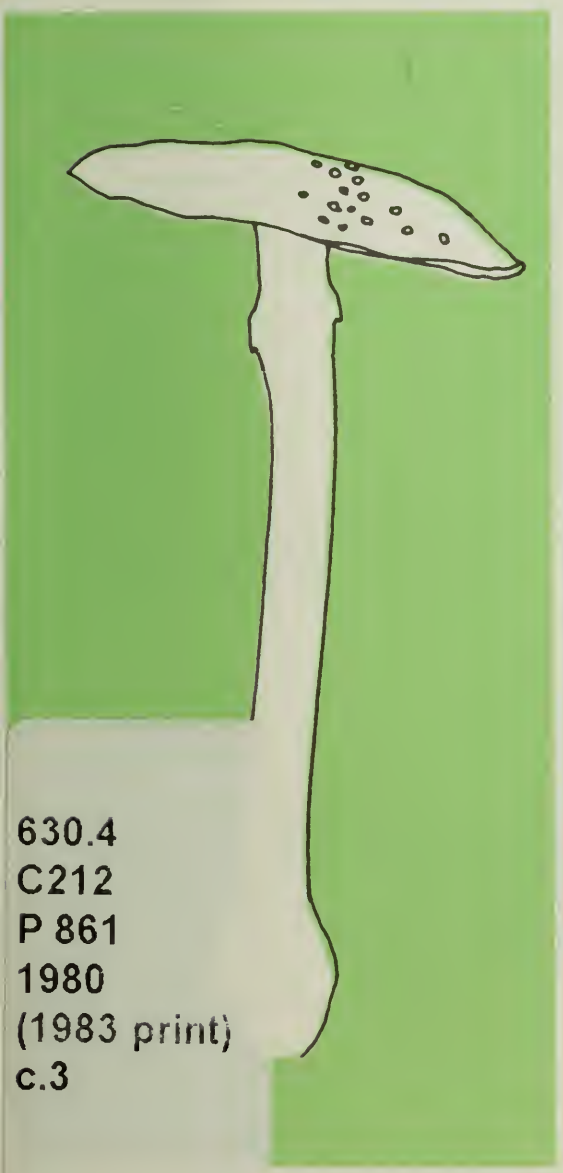
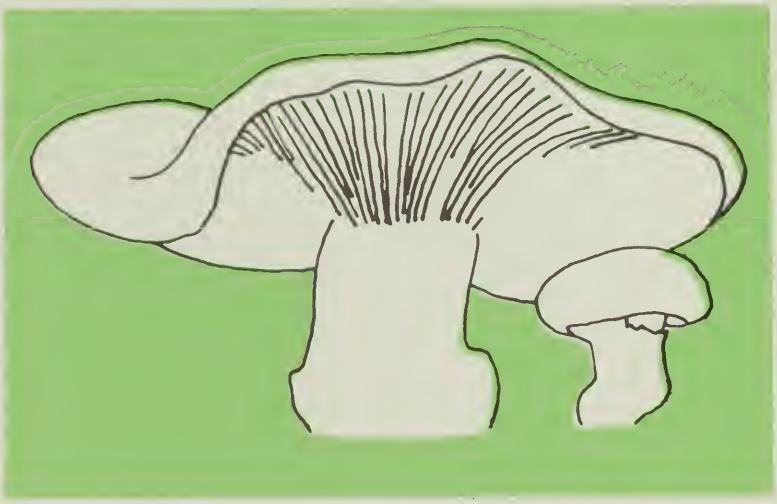
File Copy

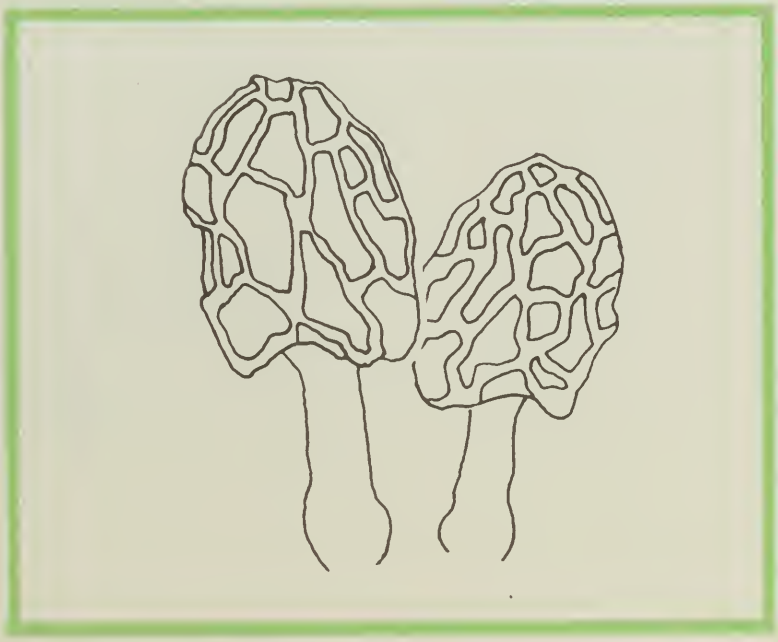
Mushroom collecting for beginners

Agriculture Canada

Publication 861







630.4
C212
P 861
1980
(1983 print)
c.3

Digitized by the Internet Archive
in 2012 with funding from
Agriculture and Agri-Food Canada – Agriculture et Agroalimentaire Canada

http://www.archive.org/details/mushroomcollecti00grov

Mushroom collecting for beginners

J. Walton Groves[1]

Former Head
Mycology Section
Plant Research Institute
Ottawa, Ont.

[1]Died May 1970.

PUBLICATION 861, available from Communications Branch, Agriculture Canada, Ottawa K1A 0C7.

©Minister of Supply and Services Canada 1980
Cat. No. A43—861/1980E ISBN: 0-662-01091-4
Revised 1980 Reprinted 1983 12M—9:83

Aussi disponible en français.

This publication is intended as a guide for the beginner who would like to use some of our wild mushrooms for food. It will not enable you to identify wild mushrooms in general, for it does not describe one in a hundred of the species that may be found in the woods.

In order to use it profitably, study the notes and illustrations and look specifically for those edible kinds described here. Everything else should be avoided. The edible species chosen for inclusion in this bulletin are all common, easily recognizable with a little care in observing the characters described, and some of them can usually be found at any time during the growing season when conditions are sufficiently moist.

Only one rule is emphasized — eat only species that you know to be edible and avoid all others.

If an accident should occur and a poisonous species be eaten by mistake, empty the stomach and intestines immediately and get a doctor as quickly as possible.

Note: Some species, often referred to as magic mushrooms, hallucinogenic mushrooms, or a wide variety of other colorful names, contain the restricted drugs psilocin and psilocybin. Possession of these native or foreign mushrooms could lead to arrest and conviction under the Food and Drug Act. Most of these species are too small to be accidentally gathered for the purpose of eating. However, naturalists interested in all types of fungi might unwittingly collect these species and unattended children might eat the common lawn species.

INTRODUCTION

In this publication the word mushroom is used in its widest popular sense and includes any conspicuous fleshy fungus. A more accurate and scientific way of using the term is to restrict it only to those fungi bearing gills, because in making a classification of plants, botanists try to bring related forms together in the same group — genus or family — and, in general, the fungi with gills are thought to be more closely related to one another than to fungi without gills. Therefore, to use the term mushroom for gill-bearing fungi only does give it some scientific meaning, but here, for the sake of convenience, it will include such forms as the morels and the puffballs even though they are distinct botanically from the gill-bearing fungi.

A considerable amount of confusion exists concerning the terms 'mushroom' and 'toadstool.' Most people using the word toadstool have in mind some poisonous or undesirable fungus, but actually this term has no scientific meaning and does not correspond in any sense to a botanical classification. Poisonous and edible species may occur in the same genus and be quite closely related. It is therefore preferable to speak only of mushrooms, some of which may be edible, some poisonous; others, although not poisonous, may have undesirable characters that make them unfit for food.

Many people seem to think that it is possible to distinguish edible from poisonous mushrooms by some simple rule or test. In fact, some even believe that they know the tests. This belief is more dangerous than complete ignorance, for these so-called tests are now known to be worthless and if relied on, may result in serious trouble. One who is aware of the danger and feels his own lack of knowledge will probably leave all mushrooms alone, but one who relies on false tests may be misled into eating poisonous species.

For instance, it is simply not true that if a mushroom peels it is good to eat. The most deadly species known, the Destroying Angel, which caused over thirty deaths in one season near New York City, peels very readily. Furthermore, the poisons produced by different mushrooms, such as the Destroying Angel and the Fly Agaric, are quite different chemical substances and have very different effects on the human body. It is not reasonable, therefore, to expect that a simple chemical test, such as the blackening of silver, would detect both types of poison. As a matter of fact, we have no evidence that this test will detect either of these poisons.

There is no simple rule or test to distinguish edible and poisonous mushrooms, but even the layman, if properly informed, may enjoy tasty mushroom dishes in safety. One need not be a trained botanist in order to recognize a wild strawberry, raspberry, or blueberry, and the ordinary person finding these plants in the woods feels no hesitation in eating a few berries on the spot or

bringing some home for future use. Many other berries seen in the woods and fields are avoided because their identity and edibility are not known.

Exactly the same attitude should be adopted toward mushrooms. It is comparatively easy for anyone with a little study and careful observation to become acquainted with half a dozen or so species and be able to recognize them on sight. **Eat only those species that you know to be edible and leave all the others alone.**

PARTS OF A MUSHROOM

The structure we call a mushroom is, in reality, only the fruiting body of the fungus. The vegetative part of the plant consists of a system of branching threads and cord-like strands that ramifies through the soil, manure, or other material on which the fungus may be growing. This vegetative part is used by commercial mushroom growers to plant their beds and is commonly called mushroom spawn.

After a period of growth and accumulation of food reserves, and under favorable conditions of temperature and moisture, the spawn will produce the fruiting structures that we call mushrooms. The principal parts of the mushroom are illustrated by Diagram 1, which represents sections through an *Amanita,* the genus that includes the deadly poisonous species such as Destroying Angel and Fly Agaric.

The fruiting body consists of a stem supporting a cap on the underside of which are the gills. The gills form a series of plates that radiate from the stem to the margin of the cap. They may be free from the stem, or attached to it, or run part way down it in different species of mushrooms. They may be set close together or crowded, or may be relatively distant from one another, and may vary from broad, thin plates to scarcely more than folds on the lower surface of the cap. On the sides of the gills are produced the reproductive bodies or spores, corresponding to the seeds of higher plants.

In some mushrooms, the young plant is at first completely enclosed in a sheath of tissue called the universal veil or volva. As growth proceeds, the volva tears open and the young mushroom emerges, leaving remnants of the volva as a sheath surrounding the base of the stem. This universal veil is not present in all mushrooms but is a very important character to look for in recognizing the dangerous genus *Amanita.*

Some kinds of mushrooms in the young stage have the gills enclosed by a sheet of tissue that stretches from the stem to the margin of the cap. This is known as the partial veil, and it usually tears around the margin of the cap and remains hanging on the stem so that it forms a ring or annulus on the stem.

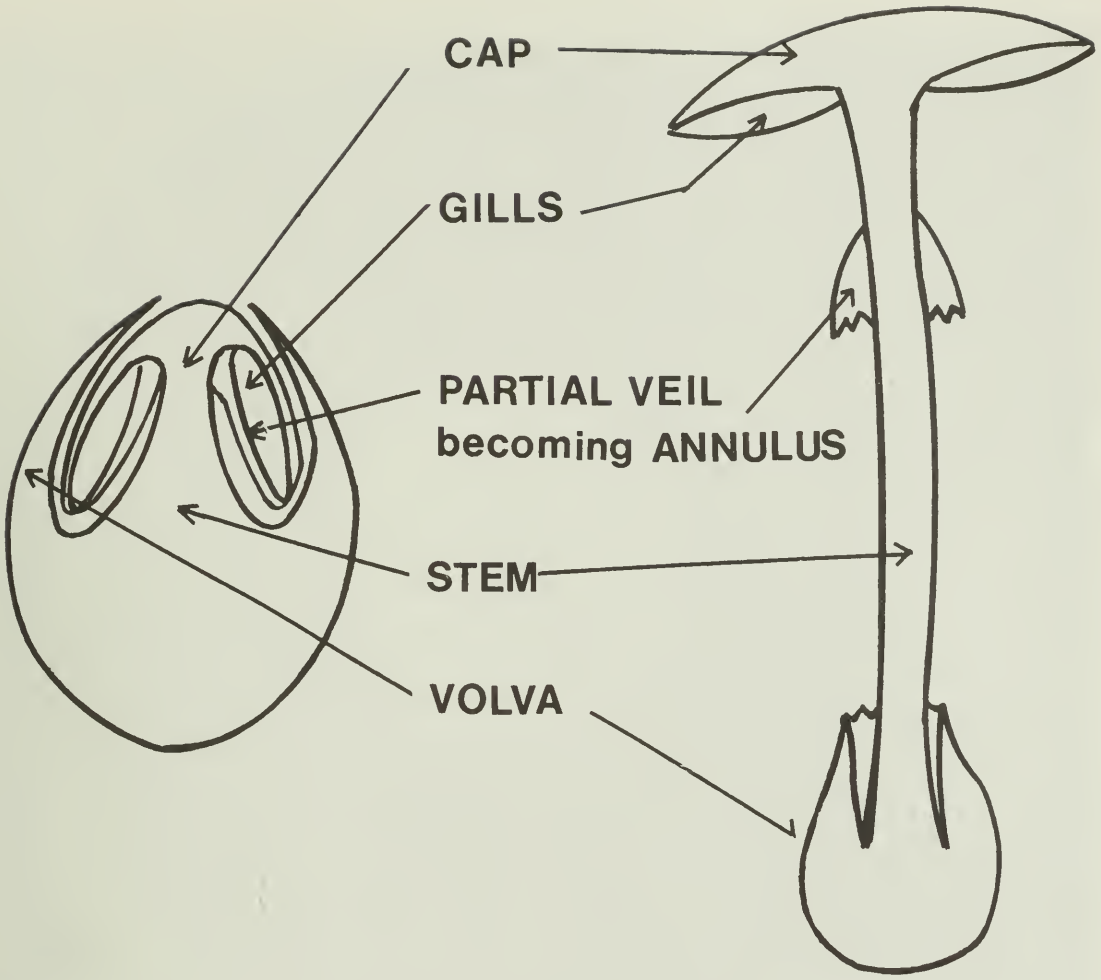


Diagram 1. Principal parts of the mushroom illustrated by sections through an *Amanita*. Young plant on left, mature plant on right.

SPORE PRINTS

In the descriptions and notes that follow, reference will frequently be made to the color of the spores. The spore color is a very constant character and frequently of greater importance in identifying a species.

The spores are produced on the sides of the gills in immense numbers, forcibly discharged into the air, and borne away by the air currents. Obviously very few of them ever find suitable conditions for growth or the earth would be covered with mushrooms. In order to determine the color, it is necessary to make the mushroom discharge its spores onto a piece of white paper.

Cut the stem off close to the cap and lay the cap on a piece of white paper with the gills down. Cover the cap with a glass jar or some sort of pan to protect it from air currents and leave it for a couple of hours or so. When the cap is removed, it will be found that

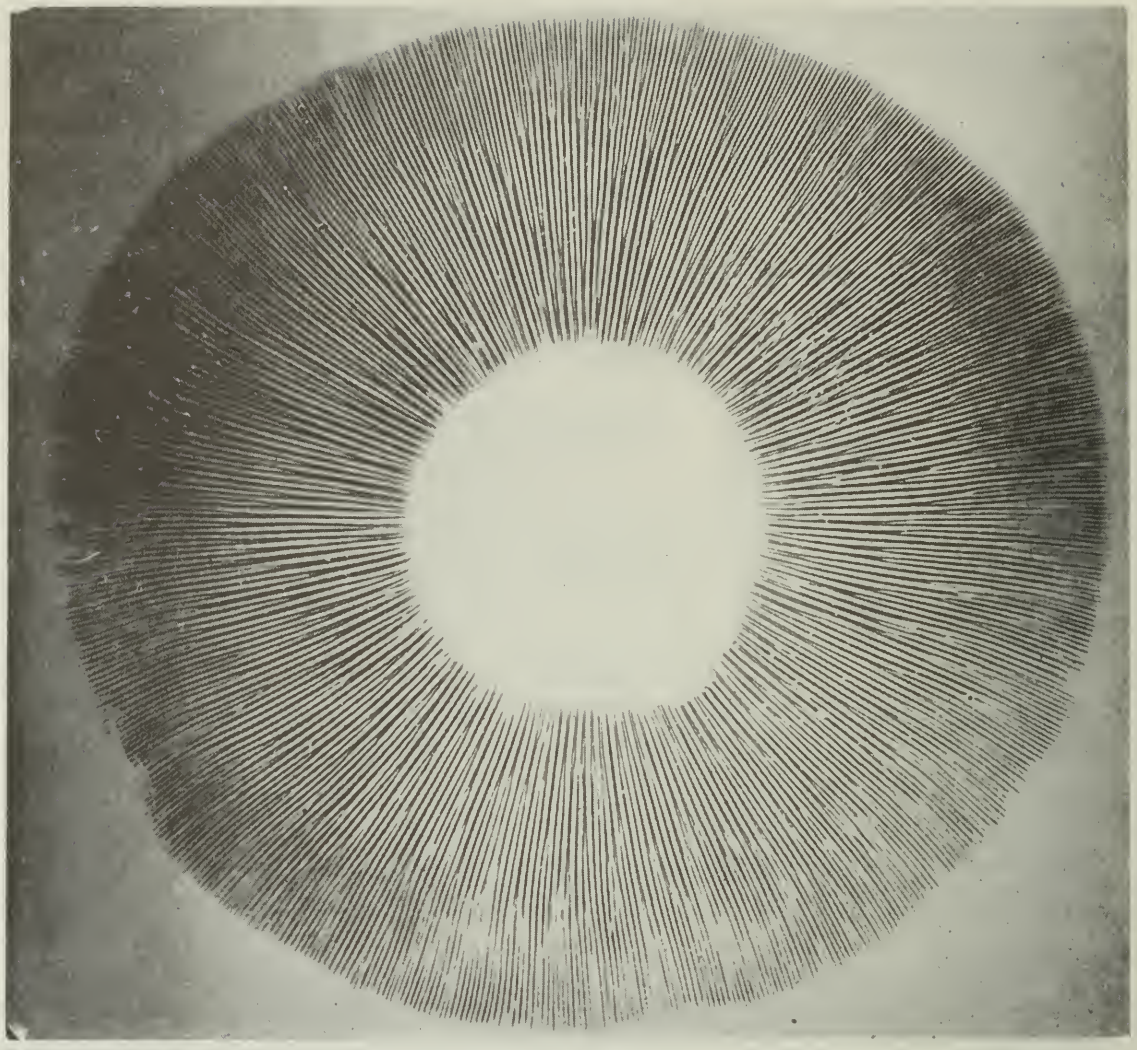


Fig. 1. Spore print of a mushroom.

the spores have been deposited in such a way as to form a pattern of the gills (Fig. 1), and the color of the spores can be told immediately from this spore deposit or spore print.

Time can be saved by getting spore prints in the field. When a specimen is found of which you wish to know the spore color, cut off the stem, lay the cap on white paper with the gills down, wrap it in waxed paper and lay it on the bottom of the collecting basket, making sure that the gills are downward. Probably by the time you reach home the spore print will be ready.

GATHERING MUSHROOMS

The equipment required for gathering mushrooms is very simple. A sharp knife, some pieces of waxed paper or tissue paper, and a basket or even a paper bag in which to place the specimens

are all that is required. However, depending on whether you are collecting them for study or only for the table, the method of handling them may vary a little.

Before any species is eaten, it should be studied in detail. When you think you have found one of the species described here, gather it carefully, making certain that you get the whole plant. It may be necessary to dig into the ground with your knife, for it is very important to obtain the base of the stem. Then wrap the specimens separately in the paper and bring them in where you can check each point in the description.

You will not learn to know a species from a single collection. Mushrooms are living organisms and show variations between individuals and in different environmental conditions. The descriptions in this publication are based as closely as possible on normal and typical forms. Until you feel that you are familiar with a species, it is wise to discard specimens that do not quite fit the description. Perhaps they are just variants or perhaps you may have a different species.

Only when you know an edible species thoroughly should you attempt to collect it for food. It is advisable to cut off the stem well above the ground to avoid getting dirt in the specimens. Careful collecting will save much trouble later. Choose young, sound specimens and discard any that appear overmature. Cut them open to see that they are not infested with insect larvae and, if you find the flesh shows tunnel-like pinholes, such specimens should be discarded also.

Since some species require much longer cooking than others, it is usually better to keep each kind separate. Before being cooked, they should be washed and dried, but it is not necessary to peel them unless the caps are sticky or have large scales, such as in the Parasol Mushroom. In some species the stems are tough and you will want to discard them, but in others such as the Meadow Mushroom they are tender and of good flavor.

Recipes for using mushrooms are available in many cookbooks and mushroom books. Probably most people like to fry them in a little butter. If this is done, do not use too much butter. Mushrooms have sometimes received unjust blame for digestive disturbances when the excessive butter was the cause.

MEADOW MUSHROOM

(*Agaricus campestris* Fr.)
EDIBLE. Fig. 2-4 (page 11)

The cap is 2.5-10 cm broad, occasionally larger, convex, finally becoming nearly flat, at first silky, then becoming torn into delicate, fibrillose scales, usually white, sometimes pale brown, especially in age, the margin extending beyond the gills and often fringed with

fragments of the veil adhering to it. The flesh is firm, white, and does not change color when bruised. The gills are free from the stem, crowded, moderately broad, at first pink, changing slowly to purple brown and finally turning blackish. The stem is white, smooth, 3.8–7.5 cm long and 0.3–1.3 cm thick, equal or sometimes narrowed toward the base, solid but with a softer central core. The annulus or ring is about half way up the stem or higher, white and membranous, and usually has torn edges. The spores are nearly chocolate brown in a good print.

It grows in meadows, pastures, and open fields and is usually found in September or October, but occasionally may appear in the spring. Sometimes two or three will arise from the same base, but usually they occur separately in groups, frequently in circles or arcs of circles.

As may be seen from Fig. 3 and 4, in the button stage the gills are enclosed by a layer of membranous tissue, the partial veil, that stretches from the stem to the margin of the cap. As the cap expands, it tears open, leaving most of the veil adhering to the stem to form the annulus, and the remainder adhering to the margin of the cap to give it the fringed appearance. Fig. 3 and 4 illustrate successive stages in the formation of the annulus.

Compare this carefully with Fig. 17 of the Destroying Angel where, in addition to the partial veil enclosing the gills, there is a universal veil enclosing the entire young mushroom. If you collect mushrooms in the button stage, be very careful to avoid collecting those with a universal veil, but it would be much safer not to collect any mushroom in the button stage.

The Meadow Mushroom is probably the best known and most generally used of all the wild species. The whitish caps, the pink gills that slowly turn purple brown, and the fairly stout stem with a ring near the middle are the principal distinguishing characters.

The cultivated mushroom is very similar in appearance to the Meadow Mushroom. It was long thought that the cultivated mushroom was a form of this species, but many students of the mushrooms are now inclined to the view that it is a distinct species. However, it is so similar to the Meadow Mushroom that an acquaintance with the cultivated species should enable you to recognize the Meadow Mushroom in the field.

OYSTER MUSHROOM

(*Pleurotus sapidus* (Kalchbr.) Sacc.)
EDIBLE. Fig. 5 (page 12)

The cap is 7.5–18 cm broad, somewhat fan-shaped, convex to nearly flat, smooth, moist, variable in color from whitish to dark grayish brown, sometimes with the margin becoming upturned in age and often wavy or lobed. The flesh is firm and white, and does

Fig. 2. Meadow mushroom, single specimen.
Fig. 3. Meadow mushroom, series of four young specimens, side view.
Fig. 4. Meadow mushroom, series of four illustrating the tearing of the partial veil and formation of the annulus.

Fig. 5. Oyster mushroom. Cluster on end of a log.
Fig. 6. Masked Tricholoma, three specimens.

not change color when bruised. The gills are whitish, close to somewhat distant, rather broad, extending down the stem in lines which form a network. The stem is more or less to one side of the cap, sometimes nearly central, sometimes almost lacking, usually short, stout, and somewhat curved, white, solid, hairy at the base. The spores are pale lilac to grayish lilac.

Watch for this species on the trunks of various deciduous trees, elm, maple, willow, or poplar, where it often grows in large shelf-like clusters. It may be found at any time from May to October, and it has been claimed that successive crops may be obtained by watering a log on which it is known to be growing.

The principal distinguishing characters are the lilac spore print and the occurrence on wood.

The exact identity of this species is somewhat of a puzzle. Older mushroom books call the Oyster Mushroom *Pleurotus ostreatus* (Fr.) Quél. and say the spore print is white. *P. sapidus* was supposed to differ only in having a lilac spore print. However, every specimen tried by the author has given a lilac spore print and in the United States others have had the same experience, so that, if there is any difference, it is obvious that our common species is *P. sapidus*. The problem is of academic interest only since both species are said to be edible.

There is some difference of opinion regarding the edible qualities of this mushroom. Some have claimed that it is tough and tasteless, but others prize it very highly. It is recommended that only young specimens be used since older ones apparently become tough. The manner of cooking is also of some importance with this species. The best method is said to be to dust with salt and pepper, dip in beaten egg, then in bread crumbs and fry in smoking hot fat.

MASKED TRICHOLOMA

(*Tricholoma nudum* (Fr.) Kummer)
EDIBLE. Fig. 6 (page 12)

The cap is 6.4–18 cm broad, at first convex, becoming flat, smooth, moist but not sticky, lilac or lavender colored, sometimes purplish, fading to grayish, whitish, or brownish, tinged with lilac, the margin incurved for some time and then often wavy. The flesh is thick, tinged lilac, fading to whitish, sometimes water-soaked in wet weather. The gills are rounded behind, narrowly attached to the stem, sometimes nearly free, close to crowded, moderately broad, at first bluish or lavender, then becoming grayish. The stem is 2.5–8.9 cm long, and 1.3–3.2 cm thick, solid, bulbous at the base, equal or tapering slightly upward, slightly mealy above or becoming smooth, at first blue, fading to lilac or lilac gray. The spores are pinkish, or a dirty flesh color.

It occurs singly, in groups, or occasionally in small clusters, on the ground in either coniferous or deciduous woods during the late summer and fall.

The most striking characters of this species are the bluish or lavender color fading to whitish, and the grayish pink spore print. It is not the only bluish species, hence the spore color should be checked. Most of the other bluish species will give a rusty brown spore print, and one that has a white spore print also has a strong sweetish odor, which will distinguish it. Some small bluish species with pink spore prints may be found, but they are so much smaller that they are unlikely to be confused with the Masked Tricholoma.

DELICIOUS LACTARIUS

(*Lactarius deliciosus* (Fr.) S. F. Gray)
EDIBLE. Fig. 7-10 (page 15)

The cap is 6.4-13 cm broad, depressed in the center, smooth, somewhat sticky to the touch, bright reddish orange, often with concentric zones of brighter color, later fading to grayish or gray green, with the margin inrolled at first, then becoming elevated. The flesh is firm, whitish but, when broken, soon appearing to turn orange because of the exuded milk of this color, and then slowly changing to greenish. The gills are attached to the stem, running down it slightly, close, narrow, colored like the cap or more yellowish, and becoming greenish when bruised or in age. The stem is 3.8-10 cm long and 1.3-1.9 cm thick, stuffed with a pith, soon becoming hollow, equal or narrowed at the base, colored like the cap or paler, often with more brightly colored orange spots. When the gills or the flesh of the cap or stem are broken a bright orange juice or milk appears. The spores are faintly yellowish.

It grows scattered or in groups on the ground in moist woods or boggy places during the late summer and fall.

The genus *Lactarius* includes a large number of species that exude a milky juice, but this is the only one in which the juice is bright orange. The greenish stains that develop in this species make it rather unattractive in appearance, but it is one of the best edible species and is very easily identified.

SHAGGY MANE

(*Coprinus comatus* Fr.)
EDIBLE. Fig. 11, 12 (page 16)

The cap is barrel-shaped or cylindric, about 5-15 cm long and 2.5-5 cm thick, gradually expanding and becoming somewhat bell-shaped as it matures. When very young it is covered with a brownish cuticle but, except on the very top, this soon becomes torn into

Fig. 7. Delicious Lactarius, side view of a single specimen.
Fig. 8. Delicious Lactarius, top view showing zoning on the cap.
Fig. 9. Delicious Lactarius, section showing staining of the flesh by the milk.
Fig. 10. Delicious Lactarius, section showing gill attachment.

Fig. 11. Shaggy Mane, series of three in section showing the beginning of the darkening of the gills, and a single overmature specimen at the right in which the gills are partially dissolved.
Fig. 12. Shaggy Mane, series of four specimens, all in edible condition.

brownish, shaggy scales, with the white to pinkish flesh showing through. The flesh is thin, soft, and fragile, and the margin becomes split and turned back in older specimens. The gills are almost free from the stem, broad, crowded, at first white, becoming pinkish, then black and dissolving into an inky fluid starting at the outer edge. The stem is about 5–15 cm long, 0.6–1.9 cm thick, equal or tapering upward from the somewhat bulbous base, hollow, smooth, with a movable annulus usually near the base. The spores are black.

It is fairly common along roadsides, on lawns, fields, or city dumps. It usually occurs singly in groups, but sometimes two or three arise from the same base.

The Shaggy Mane is one of the best known mushrooms and is eaten by a great many people. The shape, shaggy cap, and dissolving gills are striking characteristics that make it easily recognized. Care should be taken to pick young specimens before the gills have started to dissolve, and they must be eaten soon after picking. A black inky mess will be the result of trying to keep them.

Mild illness has on rare occasions been reported as a result of eating this species. There is some evidence that this result was associated with the consumption of alcohol at the same time. Also, it is possible that some individuals may be allergic to this species. Hence it is advisable to try it in small amounts if you have not eaten it before, but it is eaten in perfect safety by so many people that one should not hesitate to try it.

CHANTARELLE

(*Cantharellus cibarius* (Fr.)
EDIBLE. Fig. 13, 14 (page 18)

The cap is 2.5–10 cm broad, at first convex, then becoming flattened and sometimes top-shaped and finally funnel-shaped, at first covered with fine fibrils, then becoming smooth. It is chrome yellow to egg yellow, and the margin is usually somewhat wavy or lobed. The flesh is fairly thick, firm, whitish to yellowish, and does not change color when bruised. The gills are thick, blunt on the edge, sometimes fold-like, often forking, narrow, distant from each other, extending down the stem, and about the same color as the cap. The stem is 5–8 cm long and 1.3–2.5 cm thick, tapering toward the base, smooth, solid, and colored like the cap or paler. A light spore deposit may appear whitish, but it is creamy yellow in a good print.

It may be looked for during the summer and fall, growing on the ground in either coniferous or deciduous woods. It occurs singly or in groups, or sometimes in small clusters.

The Chantarelle is very well known in Europe, where it has a great many common names. It is highly recommended for the table,

Fig. 13. Chantarelle, cluster of four, illustrating the thick, forked gills.
Fig. 14. Chantarelle, group of six.

although fully mature specimens may be tough and require longer cooking. The most distinctive characters are the bright yellow color and thick, fold-like gills.

Warning

If you find a bright yellow mushroom growing in large clusters around stumps, leave it alone. It may be the poisonous Jack O'Lantern (*Clitocybe illudens* (Schw.) Sacc.), sometimes called the False Chantarelle. It has sometimes been confused with the true Chantarelle, but they are not difficult to distinguish. The habit of growing in great clusters, and the thin, close to crowded gills of the Jack O'Lantern are quite distinctive. Fresh specimens of the Jack O'Lantern give off a pale, phosphorescent light when placed in a dark room, and this is a good test for it. However, if the specimens are old or a little dried out, they may not give off the light, so its absence should not be taken as proof that your specimen is not the Jack O'Lantern.

PARASOL

(*Lepiota procera* (Fr.) S. F. Gray)
EDIBLE. Fig. 15 (page 20)

The cap is about 10–20 cm broad, more or less egg-shaped when young, expanding and becoming flat with a prominent elevation in the center. At first, it is covered with a brown cuticle which soon breaks up into widely spaced scales, exposing the white flesh beneath. The flesh is soft, thick, white or slightly reddish. The gills are free, remote from the stem, white, broad, and crowded. The stem is long, 18–30 cm or occasionally longer and about 0.6–1.3 cm in diameter, tapering upward slightly from the bulbous base, hollow, not smooth but with the surface layer breaking up into brownish scales or rings. The annulus, which can be moved up and down the stem, is large and thick with brownish scales on the underside. The spore print is white.

It grows singly or in groups on the ground in open woods, meadows, or pastures during August and September. In some years it is abundant, whereas in others it scarcely appears at all.

The most striking characteristic of this species is its great size. It is of excellent quality for the table, but the scales should be removed before cooking. The stem also is hard and tough, of quite different consistency from the cap and readily separates from it.

Fig. 15. Parasol, one fully expanded and three immature specimens. The rough, scurfy stem is best shown in the specimen on the right.

Warning

Be sure to get a spore print of this species before eating it. It might be confused with the poisonous *Lepiota molybdites* (G. Meyer ex Fr.) Sacc., which sometimes grows even larger but has a greenish spore print. Another thing to look at is the stem, which is smooth in the poisonous species but slightly scaly or coarse mealy in the true Parasol. *L. molybdites* (Fr.) Sacc. is now considered to be the correct name of *L. morgani.*

SMOOTH LEPIOTA

(*Lepiota naucina* (Fr.) Kummer)
NOT RECOMMENDED. Fig. 16 (page 22)

The cap is 3.8–10 cm broad, at first somewhat egg-shaped, becoming broadly convex to finally nearly flat, smooth or finely silky, sometimes becoming somewhat cracked, white or sometimes buff or smoky in age. The flesh is white, thick, and soft. The gills are free from the stem, close, moderately broad, at first white, changing slowly to pinkish when mature. The stem is 5–10 cm long, and 0.6–1.3 cm thick, tapering slightly upward from the bulbous base, stuffed in the center with a pith, later becoming hollow, smooth or slightly silky below the ring. The ring usually stands out stiffly from the stem and becomes movable in older specimens. The spores are white.

It occurs abundantly in open fields, meadows, and pastures, growing on the ground during late summer and fall.

The characters to watch for particularly in this species are the white color, the gills slowly turning pinkish, the annulus standing out stiffly from the stem, and the bulbous base of the stem.

Warning

This species is probably sent in for identification more often than any other. It is usually considered to be edible, but we have had several reports of it causing illness. Krieger (1936) states that a similar and poisonous species, *Lepiota schulzeri*, can easily be confused with it. Hence, this species should either be avoided or be eaten cautiously the first few times.

Do not eat this species unless you know both it and the Destroying Angel (*Amanita virosa*). The principal points in distinguishing the *Amanita* are: (a) the gills remain white and do not become pinkish as in the Smooth Lepiota; (b) the annulus hangs down loosely around the stem and does not stand out stiffly; and (c) a volva or membranous sheath encloses the base of the stem of the *Amanita.*

The *Amanita* usually grows in the woods and the Smooth Lepiota in open fields, but do not rely on this difference in habitat alone. The volva enclosing the base of the stem of the *Amanita* is the best single character for distinguishing the two.

Fig. 16. Smooth Lepiota, four specimens. Note the stiff annulus and somewhat bulbous but not sheathed stem.

DESTROYING ANGEL

(*Amanita virosa* Lam. ex Secr.)
DEADLY POISONOUS. Fig. 17 (page 24)

The cap is 5–15 cm broad, egg-shaped to convex, becoming nearly flat when mature, pure white, sticky to the touch, and smooth. The flesh is soft and white, with an unpleasant odor. The gills are white, free from the stem or attached by a line, crowded, and moderately broad. The stem is 5–20 cm long, sometimes longer, 0.6–2.5 cm thick, tapering slightly upward from a sheathed, bulbous base, stuffed in the center, becoming hollow, smooth or with cottony scales. The ring, which is on the upper part of the stem, is fairly large, membranous, hangs down loosely around the stem, and sometimes disappears. The universal veil or volva forms a thick, membranous cup enclosing the base of the stem, with a free margin, usually more or less lobed, and frequently buried in the ground. The spores are white.

It grows singly, usually more or less scattered but sometimes abundant, on the ground in either deciduous or coniferous woods during the summer and fall.

This is a beautiful, pure white, stately mushroom, but the most deadly poisonous species we have. It is probably responsible for more deaths than any other mushroom, and it is of the utmost importance that anyone who picks wild mushrooms for food should know this species at sight and avoid it.

The important characters are the white color of cap, stem, and gills, the loosely hanging annulus, and the cup enclosing the base of the stem. The last character is the most important and is the one most likely to be missed by careless collectors.

This cup is what remains of a universal veil, which enclosed the entire plant when young. The manner in which an annulus is formed from a partial veil is illustrated in Fig. 4 for the Meadow Mushroom. In the Destroying Angel, there is, in addition to a partial veil, a universal veil (Fig. 17), which splits across the top as the young plant emerges and then remains as a sheath enclosing the base of the stem.

Sometimes this cup or volva may be buried in the ground and the mushroom must be dug up very carefully in order to find it. In some other species of *Amanita,* it is very fragile and may break up and disappear. Only by repeated collection and study of a species can you learn to recognize these variations.

Practically all our deadly poisonous mushrooms belong in the genus *Amanita,* and it is very important that you learn the characters of this genus and avoid all the species. All species of *Amanita* have these three things in common: (a) white spores, (b) a partial veil resulting in an annulus, and (c) a universal veil or volva. It is true that some species of this genus are edible, but no beginner should ever try an *Amanita.*

Fig. 17. Destroying Angel, two mature specimens and one at lower right just emerging from the universal volva. Note the loosely hanging annulus and the base of the stem sheathed by the volva.

Should you wish to collect one of these mushrooms for further study, do not allow it to come into contact with other mushrooms that may later be used as food. Wrap it carefully and keep it separate. It is advisable to wash the hands after handling this species. The deadly nature of the poison it produces cannot be too strongly emphasized.

FLY AGARIC

(*Amanita muscaria* (Fr.) Hooker)
DEADLY POISONOUS. Fig. 18 (page 27)

The cap is 7.6–20 cm broad or sometimes larger, at first egg-shaped, then convex, becoming nearly flat at maturity, sticky to the touch, with margin slightly striate when mature. It is bright or pale orange or yellow, sometimes nearly scarlet, or faded to whitish when old, covered with whitish or pale yellowish wart-like patches, which may be washed off by rains. The flesh is thick and whitish. The gills are free from the stem or attached by a line, broad, crowded, and white to pale yellow. The stem is about 10–20 cm long or longer, 1.3–3.8 cm thick, tapering upward slightly from the bulbous base, stuffed in the center, becoming hollow, white or yellowish, and more or less concentrically scaly toward the base. The ring is on the upper part of the stem. It is large, white or yellowish, and hangs down loosely around the stem. The universal veil encloses the whole young plant, then splits around the margin of the cap, part remaining on the cap as scales or warts, and the remainder tightly enclosing the base of the stem and forming concentric ridges or scales, but not forming a free-margined cup. The spores are white.

It grows singly or in groups on the ground in either coniferous or deciduous woods. It usually appears in the late summer and fall, but is occasionally found in the spring.

The Fly Agaric is one of our most beautiful and striking mushrooms, but fortunately its bright colors tend to deter many people from eating it. Although less dangerous than the Destroying Angel, it is known to be extremely poisonous. It gets its name from the fact that it was once used to make fly poison.

If one compares this species with the Destroying Angel, it is seen that both species are enclosed in a universal veil or volva when young, but that the volva ruptures in a different way in each. In the Destroying Angel, it tears across the top, whereas in the Fly Agaric, it tears around the margin of the cap. As a result, the cap of the Destroying Angel is smooth, whereas that of the Fly Agaric is covered with scale-like or wart-like patches that are the pieces of the old volva adhering to the cap. In the Destroying Angel, the old volva forms a cup-like sheath with the free margin around the base of the stem but in the Fly Agaric, it adheres tightly to the stem and

becomes pulled apart, forming the concentric scaly rings. There is no free-margined cup at all and it might be difficult to recognize these ridges and scales as really part of the universal veil unless you understand how they are formed.

The Fly Agaric is not likely to be confused with any edible species, but it is so common and conspicuous as well as so deadly poisonous that it is one all mushroom eaters should know and avoid.

FAIRY RING

(*Marasmius oreades* Fr.)
EDIBLE. Fig. 19 (page 27)

The cap is 2.5–5 cm broad, at first convex, becoming nearly flat with a raised, somewhat rounded part in the center, smooth, pliant fleshy, with an even or sometimes slightly ridged margin. The color varies from brownish to tan or buff, or may fade to nearly white. The flesh is thick on the disk, abruptly thinner toward the margin, pale buff to whitish. The gills are free from the stem or attached by a line, rather broad and moderately distant from each other, and whitish to pale buff. The stem is 2.5–7.5 cm long and 0.3–0.6 cm thick, equal, solid, covered with a fine down or nearly smooth, colored like the cap or paler. The spores are white.

It grows singly or in clusters, usually in circles or arcs of circles on grassy places, such as lawns and pastures, and it may be found at any time during the summer and fall after wet periods.

The Fairy Ring gets its name from its habit of growing in more or less complete rings. It is not the only mushroom that does this but it is, perhaps, the one most commonly observed. Although it is a small species, it often occurs in abundance and is a favorite of many people. It is a good species to dry for winter use.

Warning

If you gather the Fairy Ring for food, go over your collection carefully and, if you find any whitish mushrooms with narrow, close to crowded gills, discard them. There is a small species, *Clitocybe dealbata* (Sow. ex Fr.) Kummer, about the same size as the Fairy Ring, that grows in the same type of habitat and sometimes even in the same rings. If you eat this mushroom by mistake, it may make you quite ill but the result is not likely to be fatal. It is quite easy to distinguish it from the Fairy Ring by its white color and close narrow gills.

Fig. 18. Fly Agaric, four specimens illustrating different stages of maturity. Note that the universal veil tears around the margin of the cap leaving patches on the upper surface and the remainder adhering closely to the base of the stem forming scaly patches. Also note tearing of the partial veil to form the loosely hanging annulus.

Fig. 19. Fairy ring, cluster of two at left and group of four at right.

FAWN-COLORED PLUTEUS

(*Pluteus cervinus* (Schaeff ex Fr.) Kummer)
EDIBLE. Fig. 19a (page 29)

The cap is 5–10 cm broad, at first convex to bell-shaped, becoming nearly flat, often with a broadly rounded, raised part in the center, varying from dull dark brown to pale dingy tan, sometimes nearly white, soft, smooth or with dark fibrils, moist to very slightly sticky, margin even. The flesh is white, soft, very thin toward the margin. The gills are free from the stem, rather broad, close to crowded, at first white, becoming pink. The stem is 5–15 cm long and about 1–1.5 cm thick, slightly enlarged downward, whitish or tinged yellowish to brown, smooth or with scattered fibrils, solid. The spore deposit is pink.

It grows singly or in small clusters on and around old stumps or sawdust, and may be found fairly commonly during the summer and fall.

This species somewhat resembles an *Amanita* in stature and texture but the pink spore deposit and complete absence of both volva and annulus will distinguish it. Some pink-spored species in the genus *Entoloma* are known to cause illness but in *Entoloma* the gills are attached to the stem. It is important, therefore, to make sure that the gills are free when collecting *Pluteus cervinus*.

EDIBLE BOLETUS

(*Boletus edulis* Bull. ex. Fr.)
EDIBLE. Fig. 19b, 19c (page 29)

The cap is 6.4–15 cm broad, sometimes larger, convex to nearly flat, smooth, dry to very slightly sticky when moistened, rather variable in color, light buff to grayish red, yellowish brown or tawny brown, often paler toward the margin. The flesh is white or yellowish to pinkish, may be reddish under the cuticle, not changing color when broken, sweet and nutty in flavor. The tubes are slightly attached to the stem and depressed around it, at first whitish and stuffed, becoming greenish yellow. The stem is 6.4–15 cm long and 1.3–3.8 cm thick, nearly equal or swollen at the base up to 5.5 cm thick, whitish to yellowish or brownish, solid, marked with a network of raised lines, sometimes for the entire length, sometimes only in the upper part. The spores are olivaceous brown.

It grows singly or in groups on the ground in woods and open places from June to October.

The boletes are a group of fungi that are similar to the true mushrooms in appearance and in their soft, fleshy consistency, but they differ in that the spores are produced in tubes or pores rather than on the sides of gills. Most of the boletes are edible but species

in which the tube mouths are red should be avoided, and a few species are bitter or acrid to the taste. The layer of tubes should be removed before cooking. Boletes are often infested with insect larvae and it is usually difficult to obtain specimens free from them.

B. edulis is highly regarded as an edible fungus and its principal distinguishing characters are the greenish yellow tubes, thick stems with a raised network, and the sweet, nutty flavor.

Fig. 19a. Fawn-colored Pluteus.
Fig. 19b. Edible Boletus. Note network of lines on stem.
Fig. 19c. Edible Boletus.

GIANT PUFFBALL

(*Calvatia gigantea* Pers.)
EDIBLE. Fig. 20, 21 (page 31)

The fruiting body is more or less globose, 20–50 cm or more in diameter, attached to the ground by a short, cord-like root. The surface is smooth, soft leathery, sometimes like kid, white to yellowish or brownish. The interior is white, soft, fleshy, slowly becoming yellowish to olivaceous, and finally becoming powdery.

During the fall, it may be found growing in open woods, pastures, and fields.

A number of species of fungi are included under the term puffball. They vary greatly in size, but are generally more or less globose to pear-shaped, with a leathery outer skin enclosing a white fleshy interior, which at maturity becomes a powdery mass of spores.

The species illustrated (Fig. 20, 21) is the giant of the family and, owing to its size, is not likely to be confused with any other fungus. It is one of the safest for the beginner and can be highly recommended for flavor. Do not use too much butter when frying it.

Any puffball is edible if it is white and homogenous inside (Fig. 21). One of the smaller puffballs, the Gem-studded Puffball (*Lycoperdon perlatum* Pers.), is also illustrated (Fig. 22) to demonstrate this character.

Warning

Be sure to cut all puffballs across before using them. One might confuse a young Destroying Angel that was still enclosed in its universal veil with a puffball. Also, the eggs of the Stinkhorn resemble puffballs. However, when cut open, the young *Amanita* will reveal the outlines of the underdeveloped mushroom and the Stinkhorn egg will have a ring of jelly-like material at the outside (Fig. 24).

STINKHORN

(*Phallus ravenelii* Berk. & Curt.)
NOT EDIBLE. Fig. 23, 24 (page 32)

The fruiting bodies first appear as pinkish, egg-shaped structures about 2.5–5 cm in diameter. They are rather tough, wrinkled at the base, and attached to the ground and to each other by pinkish lilac strands. These 'eggs' split open and a stalk with a bluntly conical head or cap emerges. The stalk is usually 10–15 cm in length and 1.3–3 cm in diameter, equal or tapering upward slightly,

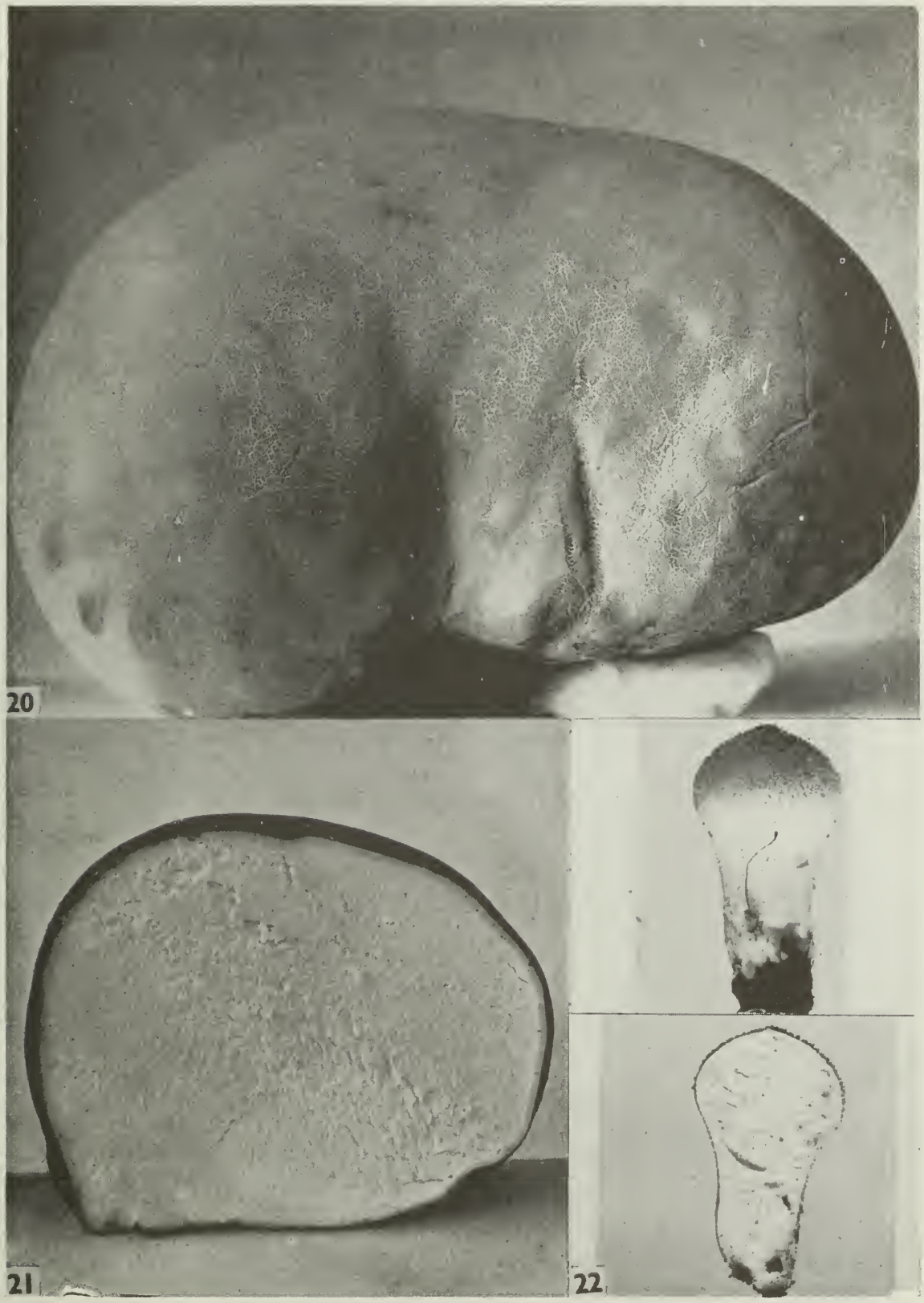


Fig. 20. Giant puffball, single specimen.
Fig. 21. Giant puffball, section showing white, homogeneous flesh.
Fig. 22. Gem-studded puffball, single specimen above and section below.

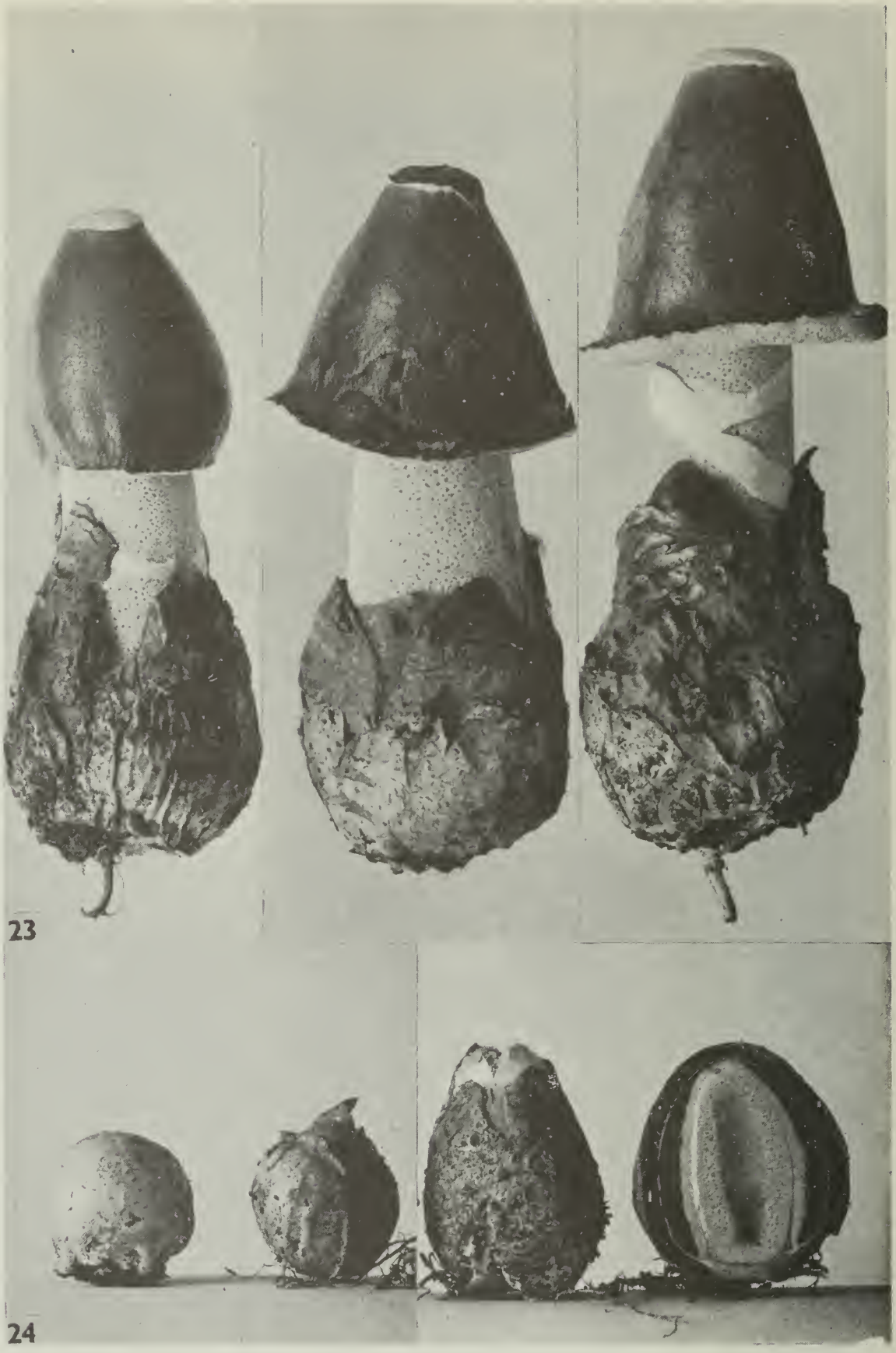


Fig. 23. Stinkhorn, three mature specimens.
Fig. 24. Stinkhorn, series of three showing breaking of the "egg", and section of an "egg" showing the spongy texture and the jellylike ring at the outside.

yellowish to whitish, spongy or honeycombed, and encircled by a white membranous band from the veil. The cap is conical, attached to a raised whitish disk with a hole in the center, shiny, greenish or olive gray, and extremely ill smelling.

It grows in groups in sawdust or around rotten wood during the late summer and fall.

These unattractive fungi are not likely to be tried as food, but they are included here because of the possibility of mistaking one of the 'eggs' for a puffball, and also because their appearance usually arouses considerable curiosity and disgust. Other species may be found, such as one which is much smaller and is pink with a reddish cap, and another which has a beautiful lacy veil hanging from the top of the stem and extending below the cap.

The spores are produced in the slime, and the evil smell is said to attract carrion beetles and other insects, which aid in dispersing the spores. The Stinkhorns are more closely related to the Puffballs than to the true mushrooms.

MOREL

(*Morchella esculenta* Fr.)
EDIBLE. Fig. 25 (page 34)

The cap is grayish brown to yellowish brown, more or less elongated, usually rounded at the top, sometimes slightly conical, sometimes nearly globose; 5–12 cm long and 1.9–3.8 cm broad at the widest point, sometimes much larger. The surface is covered with rounded to irregular or somewhat elongated pits, sometimes arranged more or less in rows, more often irregularly arranged. The stem is 5–7.5 cm long and 1.3–2.5 cm thick, whitish, hollow, smooth or slightly scurfy, the surface even or wavy.

It grows on the ground, usually singly or in groups in open woods, orchards, and pastures during May and early June.

Many mushroom eaters consider that the morels have the finest flavor of all mushrooms. The conical or rounded caps covered with deep pits are so characteristic that they cannot be confused with anything else once you have seen them.

They are rather variable in size, shape, and color and more than one species may be found, but all are edible and it is only necessary to be sure that you can recognize a morel.

Warning

Until you can identify a morel with certainty, be sure to compare your specimens with descriptions and figures of the False Morel (Fig. 26). This is the only fungus that might be confused with a morel, but it is easily distinguished by the convoluted rather than pitted cap.

Fig. 25. Morel, three mature specimens, a longitudinal section at upper right, and a cross section in the center.

FALSE MOREL

(*Gyromitra esculenta* Fr.)
POISONOUS. Fig. 26 (page 35)

The cap is 2.5–7.5 cm broad, very variable and irregular in shape, from nearly globose to more or less lobed, and the surface is irregularly wrinkled, folded, convoluted but not pitted, and reddish

Fig. 26. False morel, five mature specimens showing variations in shape, a longitudinal section in the center, and a cross section of the stem in right center.

brown to dark brown. The stem is about 2–5 cm in length and 1.3–2.5 cm thick, whitish, hollow, fragile, and usually somewhat compressed and grooved.

It grows singly or in groups, sometimes in clusters of two or three, on the ground, usually around conifers, during May and June.

Although this fungus is not really very much like a morel, it is the only one with which a morel is likely to be confused. It is a dangerous fungus. Many people eat it and suffer no ill effects, but

many authentic cases of severe poisoning have been reported and even deaths have been attributed to it.

The toxic properties of this species are due to the presence of monomethylhydrazide (MMH). This poison passes off in vapor at relatively low temperatures and is usually removed by boiling. The water used for boiling the mushrooms and the steam given off may, however, contain enough of the toxin to cause poisoning. Also, the amount of poison needed to have an effect on a person varies from individual to individual. For these reasons it is recommended that this fungus not be eaten.

ACKNOWLEDGMENT

The photographs in this publication are from the files of the Mycology Section, Biosystematics Research Institute, Research Branch, Agriculture Canada, Ottawa, Ontario.

SELECTED BIBLIOGRAPHY

Bandoni, R. J., and Szczawinski, A. F. 1976. Guide to common mushrooms of British Columbia. 5th rev. ed. B.C. Prov. Mus., Handbook 24.

Graham, V. O. 1944. Mushrooms of the Great Lakes Region. Dover Publ., 180 Varick Street, New York. (Reprinted in 1970).
Useful throughout Canada.

Groves, J. W. 1962. Edible and poisonous mushrooms of Canada. Agric. Can. Publ. 1112. Supply and Services Canada, Ottawa.

Heim, R. 1969. Champignons d'Europe. Editions N. Boubée & Cie, 3, Place Saint-André-des-Arts, Paris VI.
Useful throughout Canada and highly recommended.

Kauffman, C. H. 1918. The gilled mushrooms of Michigan and the Great Lakes Region. Dover Publ., 180 Varick Street, New York. (Reprinted in 1971).
Useful throughout Canada.

Krieger, L. C. 1936. The mushroom handbook. Dover Publ., 180 Varick Street, New York. (Reprinted in 1967).
Highly recommended as an interesting and informative introduction to the study of mushrooms.

Lange, M., and Hora, F. B. 1963. Mushrooms and toadstools. E.P. Dutton, 201 Park Ave., S., New York.
Probably the easiest book to use for the beginner.

Malloch, D. W. 1976. Morels—A gourmet's delight. Agric. Can. Publ. 1581. Information Services, Agriculture Canada, Ottawa.

McIlvaine, C., and Macadam, R. K. 1902. One thousand American fungi. Dover Publ., 180 Varick Street, New York. (Reprinted in 1973).
A good book for the gourmet: if anything could be called a mushroom, McIlvaine tasted it.

Miller, O. K. 1972. Mushrooms of North America. E.P. Dutton, 201 Park Ave., S., New York.
Excellent colored photographs.

Pomerleau, R. 1951. Mushrooms of Eastern Canada and the United States. Editions Chantecler, 744 Rockland Ave., Montreal.

Romagnesi, R. 1962. Petit atlas des champignons de France. Les Editions Bordas, 37 Rue Boulard, Paris 14.
Excellent illustrations and useful throughout Canada.

Smith, A. H. 1963. The mushroom hunter's field guide. Univ. Michigan Press, Ann Arbor, Michigan.
Excellent large photographs of 188 species, many in color.

CONVERSION FACTORS

Metric units	Approximate conversion factors	Results in:
LINEAR		
millimetre (mm)	x 0.04	inch
centimetre (cm)	x 0.39	inch
metre (m)	x 3.28	feet
kilometre (km)	x 0.62	mile
AREA		
square centimetre (cm^2)	x 0.15	square inch
square metre (m^2)	x 1.2	square yard
square kilometre (km^2)	x 0.39	square mile
hectare (ha)	x 2.5	acres
VOLUME		
cubic centimetre (cm^3)	x 0.06	cubic inch
cubic metre (m^3)	x 35.31	cubic feet
	x 1.31	cubic yard
CAPACITY		
litre (L)	x 0.035	cubic feet
hectolitre (hL)	x 22	gallons
	x 2,5	bushels
WEIGHT		
gram (g)	x 0.04	oz avdp
kilogram (kg)	x 2.2	lb avdp
tonne (t)	x 1.1	short ton
AGRICULTURAL		
litres per hectare (L/ha)	x 0.089	gallons per acre
	x 0.357	quarts per acre
	x 0.71	pints per acre
millilitres per hectare (mL/ha)	x 0.014	fl. oz per acre
tonnes per hectare (t/ha)	x 0.45	tons per acre
kilograms per hectare (kg/ha)	x 0.89	lb per acre
grams per hectare (g/ha)	x 0.014	oz avdp per acre
plants per hectare (plants/ha)	x 0.405	plants per acre

CAL/BCA OTTAWA K1A 0C5
3 9073 00188401 6